

Soft Cost of Energy Storage Deployments

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Session # 603



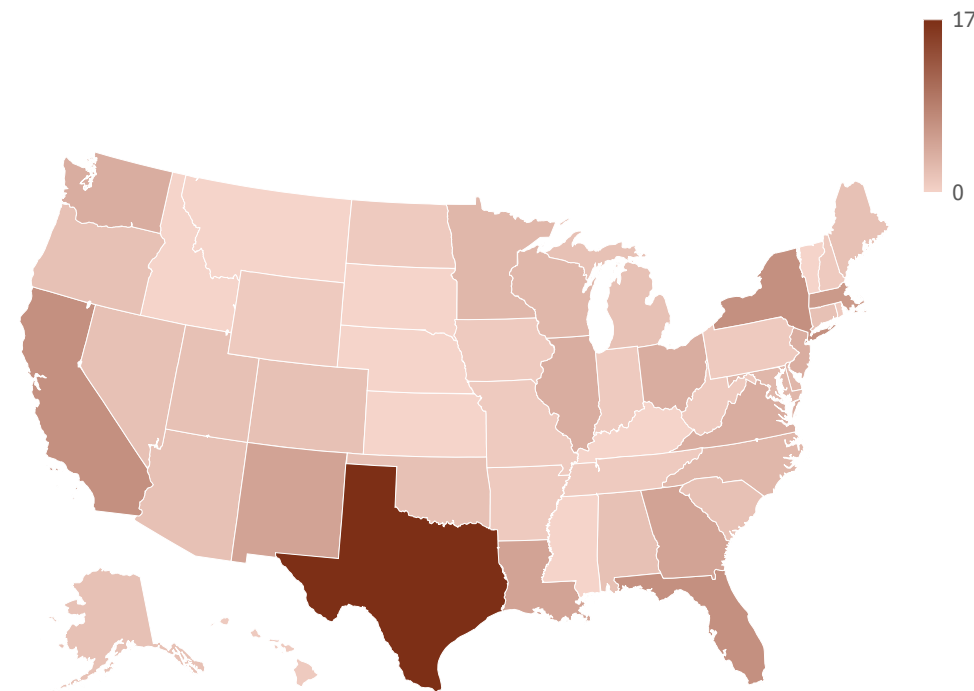
Project Overview

- **Goal:** Improve understanding of costs and barriers associated with energy storage project development
- **Current Practices:** Analysis of drivers is often based on anecdotal information rather than consistent data
- **Why PNNL:** Project dovetails our experience in regulatory/economic analysis, providing data to support developer feedback on regulatory processes
- **Innovation:** PNNL worked with installers to identify cost line items, allowing for apples-to-apples comparisons of project pain points
- **Duration:** FY 25-26
- **Impact:** Work allows us to pinpoint inefficiencies in the development process that can be eased through streamlined processes
- **Vertical/Investment Area:** Analytics
- **Strategic Pathway:** Grow Grid Capacity

Problem and Approach

- Efforts associated with factors like permitting, finance, and interconnection can increase the cost of grid storage and delay project timelines.
- Lack of clarity around these costs also make it difficult to understand how regulatory reforms impact projects in the field.
 - By understanding cost drivers, regulators can adapt processes to make it **easier and cheaper to deploy**
- The PNNL team partnered with GuidePoint, a market and analytics firm, to design and administer a survey to energy storage developers.
- Respondents provided an overview of the projects they developed in 2025 and reported **line-item estimates** of their soft costs and labor requirements
- Reported costs included those associated with **contracting, installation labor, permitting, inspection interconnection, design, commissioning, customer acquisition and applying for incentives**
- We also collected metrics related to **installation timelines**

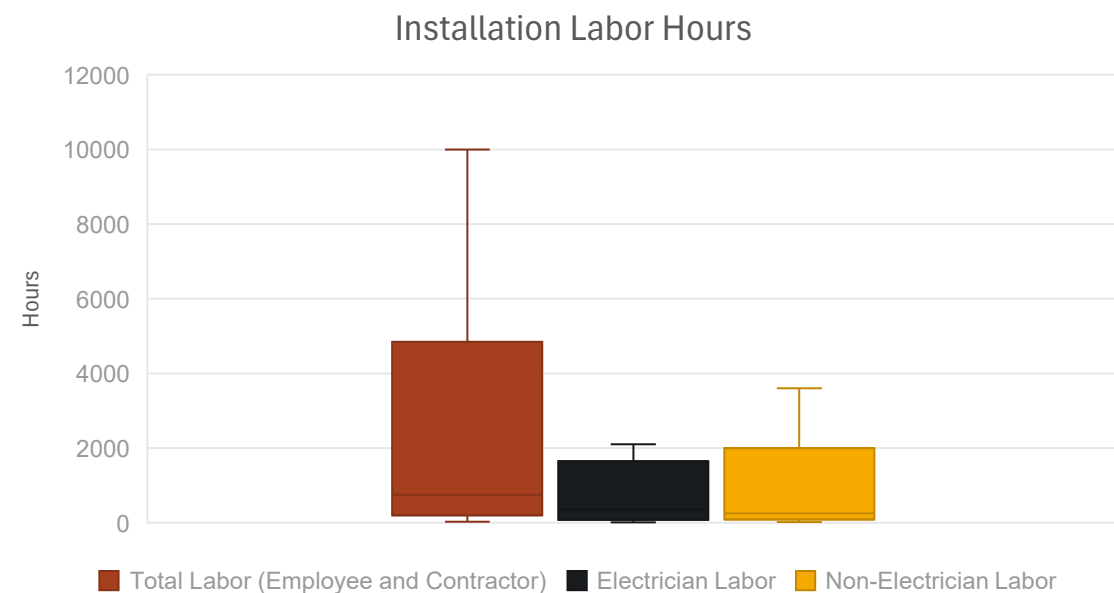
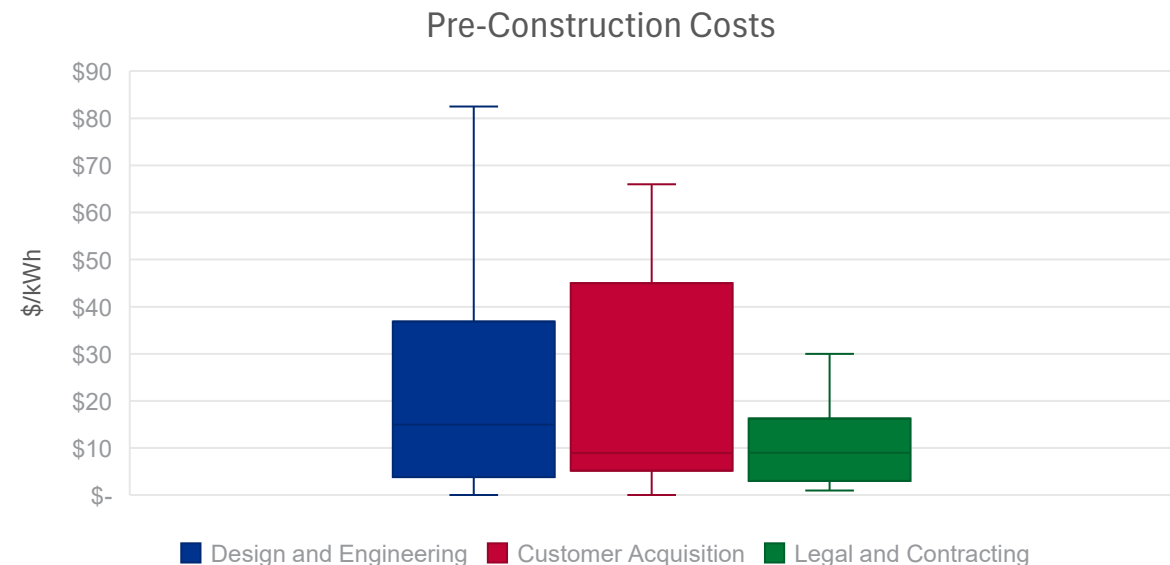
Respondent Geography



Results

- Developers reported variable costs associated with development activities:
- Pre-project activities including customer acquisition, contracting and design accounted for roughly a third of project costs
- Installation labor accounted for a much smaller percentage of project costs

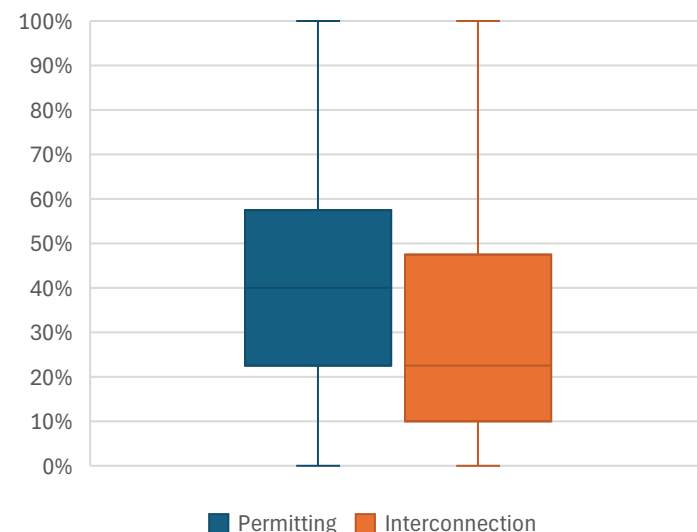
	Percent of Total Costs			\$/kWh		
	Average	Median	Std Dev	Average	Median	Std Dev
Customer Acquisition	22%	13%	22%	\$68.27	\$8.90	\$154.81
Legal & Contracting	10%	9%	8%	\$22.45	\$6.80	\$45.61
Design and Engineering	15%	10%	12%	\$37.73	\$15.00	\$60.00



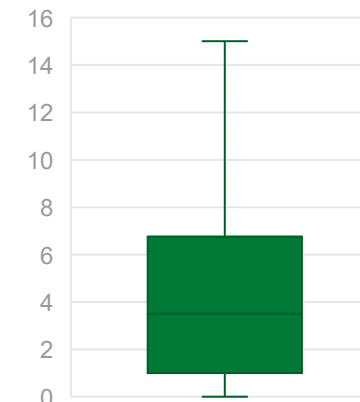
Results (2)

- Difficulties with permitting and interconnection were commonly reported:
 - The average developer assessed **12 sites** before going forward with a permit
 - Over 30%** of project interconnection applications required substantive revisions
 - Developers on average had to **cancel one project for every 5 projects built**
 - Roughly **20% of project permit applications** had unusual requirements
- Common Reasons for cancellation or delays included:
 - Needs for additional fire safety equipment
 - Visual/Environmental Concerns
 - Grid compliance issues
 - Adjustments to load or capacity forecasting

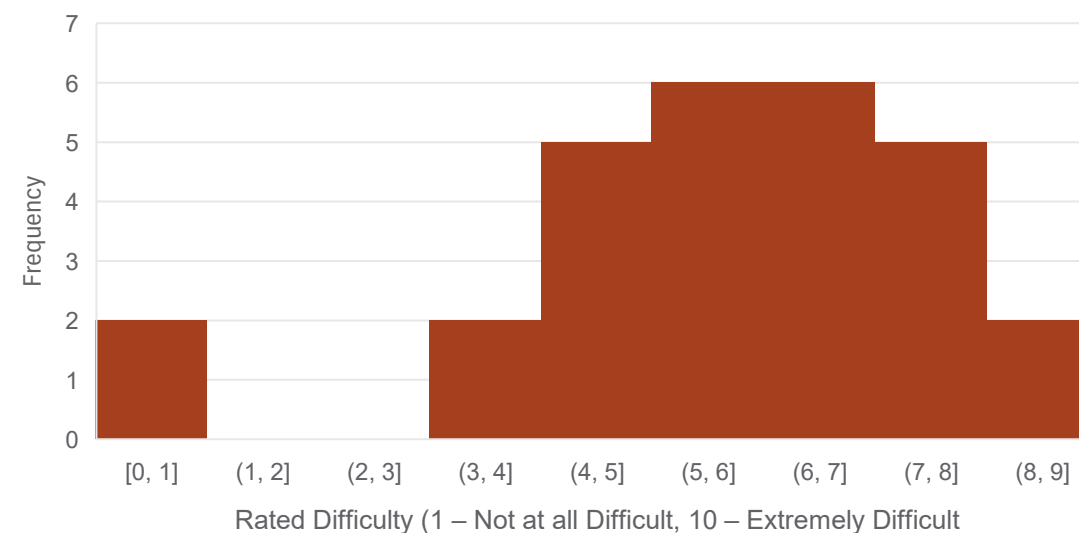
Percent of Sites that Required Corrections for...



How many sites did you abandon, after beginning the permitting process, due to local requirements or public response?



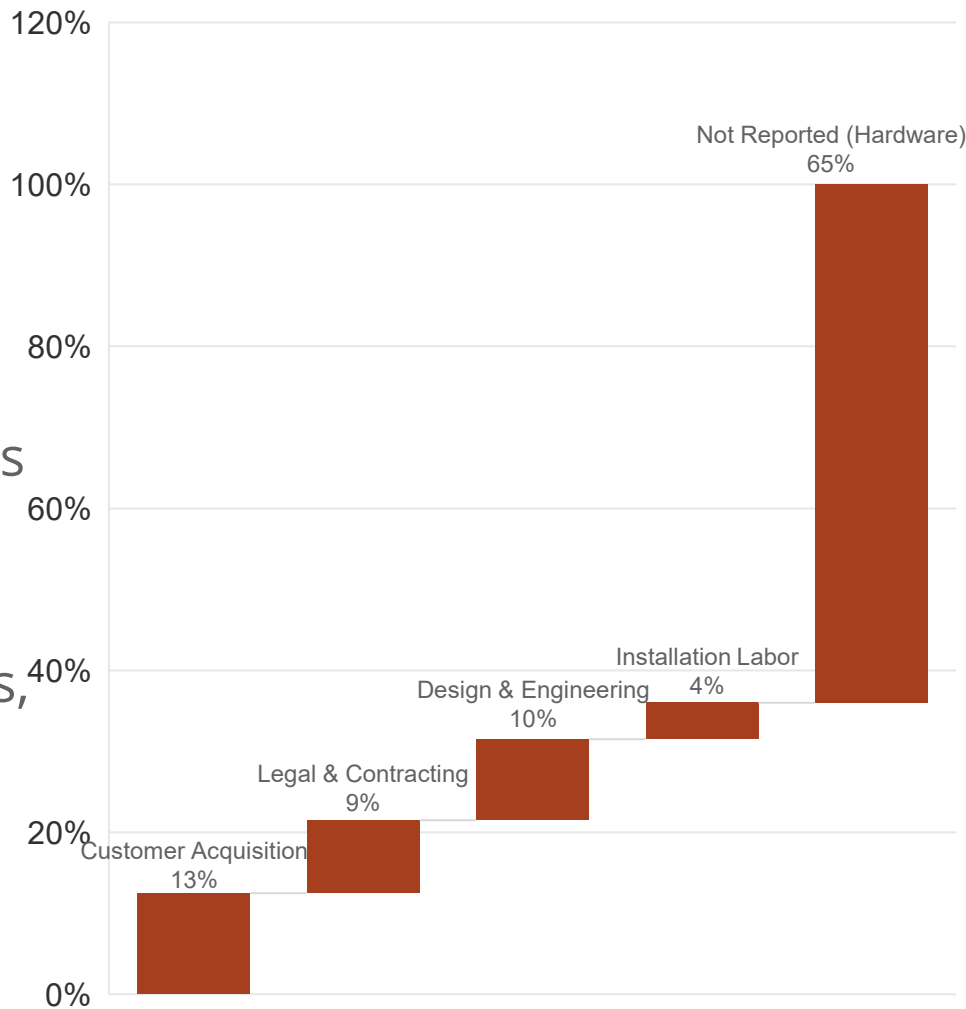
Difficulty of Permitting and Interconnection Processes



Conclusion, Impact and Next Steps

- Soft costs accounted for an average of **35% of total project costs**
- Respondents reported significant challenges associated with permitting and interconnection
- The average project required **300 days of development** between filing a permit and COD
- Developers reported numerous project cancellations
- High standard deviations indicate substantial cost variations across projects, regions and developers
- While hardware costs account for most system costs, soft costs remain significant, and have an outsized impact on project viability
- Findings will inform future regulatory work around siting and interconnection

Project Cost Stack



Acknowledgements

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